

**COMMONWEALTH OF VIRGINIA
STATE IMPLEMENTATION PLAN REVISION
FOR
PHASE I OF THE NO_x SIP CALL

STATE OPERATING PERMIT
FOR
ROANOKE CEMENT COMPANY
BOTETOURT COUNTY, VIRGINIA**

On October 27, 1998, the U.S. Environmental Protection Agency (EPA) published a final rule, "Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone" (63 FR 57355). This rule, commonly referred to as the NO_x SIP Call, required Virginia and certain other states to reduce the summertime emissions of nitrogen oxides (NO_x), which is one of the precursors of ozone pollution, and to submit a revision to their State Implementation Plans (SIPs) that identified measures necessary to achieve these reductions. The SIP revision must contain measures that will assure that sources in the state reduce their NO_x emissions sufficiently to eliminate the amounts of NO_x emissions that contribute significantly to nonattainment, or that interfere with maintenance, downwind. By eliminating these amounts of NO_x emissions, the control measures will assure that the remaining NO_x emissions will meet the level identified as the state's NO_x emissions budget. The requirements for the NO_x SIP Call are codified in 40 CFR 51.121.

EPA was subsequently challenged through the courts on the NO_x SIP Call rule. On March 3, 2000, the DC Circuit Court issued a decision that largely favored EPA while ruling against them on several issues. One of the issues for which the court ruled against EPA involved the failure to provide adequate notice of the change in control level assumed for large stationary internal combustion (IC) engines. The stay was lifted for the issues for which the court ruled in EPA's favor. Subsequently, the State Air Pollution Control Board promulgated a regulation to comply with the requirements of the NO_x SIP Call. The Commonwealth of Virginia submitted this regulation to EPA as a SIP revision on June 25, 2002. EPA approved this revision July 8, 2003 (68 FR 40520). This action is referred to as the Phase I NO_x SIP Call, and addresses only those requirements for which the stay was lifted.

EPA assumed, for purposes of calculating state NO_x budgets, certain emissions decreases from uncontrolled levels for the large (generally greater than 250 mmBtu or 1 ton per day) non-EGU sources. A 60 percent decrease is specified for non-EGU boilers and turbines, a 90 percent decrease is specified for stationary internal combustion engines, and a 30 percent decrease is specified for cement manufacturing plants. No emission reductions are assumed for the smaller sources.

EPA further determined that additional highly cost-effective controls are also available for cement manufacturing sources and internal combustion engines. On the basis of reasonable assumptions concerning growth to the year 2007, EPA then determined the amounts of emissions from these source categories that would be eliminated with those

controls. EPA further determined that there were no other controls on other NO_x sources that qualify as highly cost effective (although several controls are reasonably cost-effective).

Over 50 cement manufacturing units together emit more than 20 percent of emissions from large point sources not in the trading program (about 40,000 tons per season). EPA determined that the emissions from this particular industry are sufficiently high that it was necessary to examine the availability of cost-effective controls. To this end, EPA developed cost and control estimates in an Alternative Control Techniques (ACT) document, which was peer reviewed, and considered by EPA as the best data available. The ACT document generally supported the position that a 70 percent control level would exceed the \$2,000 per ton level used as EPA's cost-effectiveness framework. However, based on the ACT document as well as public comment, a 30 percent reduction from uncontrolled levels would be within the cost effectiveness range for reducing emissions at all types of cement manufacturing facilities. Therefore, EPA's final budget calculations assume a 30 percent control level for this source category. If states were to choose to apply a 30 percent control level to cement plants, EPA does not anticipate that this would be a major competitive disadvantage for plants located in the SIP call area, because many cement plants in the region have already successfully implemented such controls in state RACT programs.

The Roanoke Cement Company located in Botetourt County, Virginia has been identified as a source subject to the cement manufacturing facility portion of the Phase I NO_x SIP Call requirements. A legally enforceable mechanism (federally enforceable state operating permit) has been drafted to ensure compliance with the Phase I NO_x SIP Call requirements and is included as Attachment A. Attachment B contains the demonstration of how the terms and conditions of the permit meet the Phase I NO_x SIP Call requirements.

A federally enforceable state operating permit was issued to Roanoke Cement Company in order to implement the non-CTG RACT requirements of Article 51 of 9 VAC 5 Chapter 40 (9 VAC 5-40-7370 et seq.). This permit will be amended in order to meet the state's obligations under the Phase I of the NO_x SIP Call.

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SRCESPEC\ROANOKE CEMENT\RCC-PRO.DOC

**LEGALLY ENFORCEABLE MECHANISM (PERMIT)
TO ENSURE COMPLIANCE WITH
PHASE I NO_x SIP CALL REQUIREMENTS
FOR**

Roanoke Cement Company
Botetourt County, Virginia
Registration No. 20232

Under the authority provided in 9 VAC 5-170-180 and Section II of Agency Policy Statement No. 3-2006 (dated October 20, 2006), the Director of the West Central Regional Office approved and issued the permit on #, 2007, to be effective that same day. The permit was approved and issued following the procedural requirements of Virginia's federally enforceable state operating permit program, Article 5 (9 VAC 5-80-800 et seq.) of Part II of 9 VAC 5 Chapter 80.

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DEMONSTRATION OF COMPLIANCE WITH PHASE I NO_x SIP CALL REQUIREMENTS FOR

Roanoke Cement Company
Botetourt County, Virginia
Registration No. 20232

The purpose of this memorandum is to provide the technical data needed to demonstrate that current RACT requirements for Roanoke Cement Company (Registration number 20232, count-plant number 51-023-0003) satisfy the requirements of the Phase I of the NO_x SIP Call for cement manufacturing.

Facility Background

In 1995, this facility consisted of 4 long kilns, two of which were installed in 1951, one in 1953, and one in 1956. This facility also had on site a fifth traveling grate preheater kiln, installed in 1976. In terms of energy usage and NO_x formation, the 1995 configuration of this facility was inefficient in its use of energy and also in where the fuels were burned. Since only one kiln had a preheater, and none had precalciner, nearly all fuel was consumed in kiln burners, where most NO_x is formed.

In 1996, this facility went through a major modification but avoided PSD at that time by netting out. On June 12, 2003, they received a PSD permit for CO which has been most recently amended on January 22, 2007, to include modernization of the plant. The facility retired kilns 1 through 4 and modified kiln 5 to consist of a preheater/precalciner kiln with a rated capacity of 550 mmbtu/hr and a permitted annual production rate of 1,300,000 tons per year of clinker.

Since the Roanoke area was part of an Early Action Compact Plan, NO_x emission reductions were needed to show future compliance with the 8-hour NAAQS for ozone. Facilities with the potential to emit of more than 100 tpy in the Roanoke area, therefore, had to apply RACT controls. This facility received a RACT permit dated December 22, 2004, which required the installation of low NO_x burners. The NO_x reductions will be seen in the gases that bypass the precalciner. This installation was performed in early 2006, and emission reductions should be observed in monitoring data for 2006. This permit is both federally enforceable and included in Virginia's state implementation plan. The permit contains monitoring, recordkeeping, and reporting requirements as necessary to enforce the RACT provisions. These same conditions will be sufficient to ensure that compliance with the requirements of Phase I of the NO_x SIP Call for cement manufacturing is also maintained.

Current Configuration

The facility currently consists of 1 preheater/precalciner kiln with a rated capacity of 550 mmbtu/hr and is permitted for an annual production of 1,300,000 tons of clinker. The facility fires coal in both the kiln and precalciner. The facility may also burn coke and syn fuel. However, in 2005, neither fuel was used. The kiln is indirect fired, and 60% of the fuel used at the facility is fired in the precalciner. This is important because the temperatures reached by the precalciner are not conducive to the formation of thermal NO_x in the process.

This configuration is suggested by the "Alternative Control Techniques Document – NO_x emissions from Cement Manufacturing" (EPA-453/R-94-004) as the preferred configuration for minimizing NO_x emissions and maximizing thermal efficiency. The unit's thermal efficiency is important because NO_x emissions from these systems are proportional to fuel usage. Based on this configuration and the use of low NO_x burners in the kiln portion of the system, DEQ believes that the unit meets the ACT suggestions for reducing NO_x. Since the unit is configured, as described in the ACT, to reduce NO_x emissions while maximizing fuel efficiency, DEQ also believes that the unit meets the requirements of the Phase I of the NO_x SIP Call for the reduction of NO_x emissions from the 1995 baseline.

Emission Factor Methodologies – Long Kiln Configuration

In 1995, the previous database used by DEQ, the AIRS Facility Subsystem or AFS, used a federal emission factor of 2.8 lb NO_x/ton of cement produced. DEQ's master files for the Emissions Inventory System go back to 1987, and the federal factor of 2.8 lb NO_x/ton cement was already established in 1987. One item to note is that early concerns regarding cement kilns were centered on the presence of kiln dust, requiring the use of continuous opacity monitoring systems and relevant opacity standards. Since little thought was given to gaseous emissions, an inappropriate federal factor for NO_x is not inconceivable for that particular SCC. Cement is 95% clinker, so that the 2.8 lb NO_x/ton cement would become, in terms of clinker produced, 2.95 lb NO_x/ton clinker. Annual emissions using the 2.8 lb NO_x/ton cement emission factor in 1995 were 1,239 tons of NO_x.

The source classification code (SCC) associated with the 5 kilns in 1995 was 30500606. The current federal factor for this SCC is 7.4 lb NO_x/ton of clinker produced (EIIP, Volume II, Chapter 14, July 2001). For long kilns, this factor is much more appropriate than that used in the 1995 AFS. The ACT indicates that NO_x emission rates are on average 8.6 lb NO_x/ton clinker for long dry kilns. For precalciner kilns, the ACT indicates an emission rate of 3.4 lb NO_x/ton of clinker. The use of 2.8 lb NO_x/ton of cement was most likely too low, especially for long kiln configurations. A review of the facility's files could not locate any test data prior to 1995 to corroborate this emission factor.

One indicator supporting the idea that 2.8 lb NO_x/ton cement was too low to accurately assess the emissions of the 5 kilns is an examination of the 1995 thermal efficiency of the facility. The information from the 1995 data is used in the following calculation to assess thermal efficiency for the 1995 configuration.

Table 1: 1995 Thermal Efficiency Calculation		
Units 1-4, 1995 Data from CEDS		
454,464 tons cement produced		
74,518 tons coal burned	24.71 mmbtu/ton coal	1,841,339 mmbtu
27 mmcf gas burned	1000 mmbtu/mmcf	27,000 mmbtu
12,713 tons coke burned	29 mmbtu/ton coke	238,677 mmbtu
	Subtotal, Units 1-4	2,237,016 mmbtu
Unit 5, 1995 Data from CEDS		
430,616 tons cement produced		
50,373 tons coal burned	24.71 mmbtu/ton coal	1,244,717 mmbtu
12,713 tons coke burned	29 mmbtu/ton coke	368,677 mmbtu
	Subtotal, Unit 5	1,613,394 mmbtu
	Total, Units 1-5	3,850,410 mmbtu
	Thermal Efficiency:	4.35 mmbtu/ton cement

Emission Factor Methodologies – Preheater/precalciner configuration

The SCC representing the preheater/precalciner kiln configuration is 30500623, which shows a federal factor of 4.2 lb NO_x/ton clinker. This facility monitors emissions using a CEM, and the 2005 CEM data for NO_x shows an emission rate of 3.29 lb/ton clinker. This emission rate does not include the emissions reductions potentially seen from the low NO_x burners, since these burners were installed in early 2006. The facility notified the regional office in correspondence dated January 10, 2006, that the low NO_x burners would be installed during the January, 2006, outage and that startup was expected on February 4, 2006, or February 5, 2006. The low NO_x burners should get at least a 10% reduction in the 40% of the heat that goes through the kiln. Exhaust from the precalciner will not be affected by the LNB due to the recirculation of gases. However, exhaust from the precalciner should be below thermal NO_x formation temperatures.

Again, thermal efficiency can be used to assess emission rates for this process. Data for the year 2005

was used in the following calculation to determine the thermal efficiency of the facility in 2005.

Table 2: 2005 Thermal Efficiency Calculation		
Unit 5, 2005 CEDS Data		
1,146,625 tons clinker produced		
117,538 tons coal burned	24.71 mmbtu/ton coal	2,904,363 mmbtu
	Thermal Efficiency:	2.53 mmbtu/ton clinker
	@ 95% Cement to Clinker	2.41 mmbtu/ton cement

Calculated reductions, 1995 to 2005:

The preamble to the October 27, 1998, "Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone" (63 FR 57418) indicates that meeting suggested technologies in the ACT would satisfy the requirements of Phase I of the NO_x SIP Call for cement manufacturing. The preamble also discusses a 30% reduction from 1995 emission rates. Since the ACT indicates that thermal efficiency may be used to assess NO_x emissions, a comparison between 1995 and 2005 thermal efficiencies should demonstrate a 30% increase in thermal efficiency:

$$(4.35 \text{ mmbtu/ton cement} - 2.41 \text{ mmbtu/ton cement}) / 4.35 \text{ mmbtu/ton cement} = \underline{44.5\%}$$

In terms of emissions rates, the current configuration without the use of low NO_x burners may also demonstrate greater than a 30% reduction from 1995 levels, based on current SCC federal emission factors and monitored plant emission rates. The reconfiguration of the facility, based on the ACT and the increased thermal efficiency, should result in significant NO_x reductions:

$$(7.4 \text{ lb NO}_x/\text{ton clinker} - 3.29 \text{ lb NO}_x/\text{ton clinker}) / 7.4 \text{ lb NO}_x/\text{ton clinker} = \underline{55\%}$$

Additional reductions should be achieved in 2006 since the low NO_x burners were installed and should further reduce emissions.

Conclusion

Based on this information, the Roanoke Cement Company, 51-023-0003, meets the requirements of Phase I of the NO_x SIP Call for cement manufacturing. This facility meets the suggested kiln configuration as noted by the ACT, and the facility installed low NO_x burners in the kiln portion of the system. The facility also shows significant reductions (> 30%) from the 1995 long kiln configuration.